

# PATENT COOPERATION TREATY

From the  
INTERNATIONAL SEARCHING AUTHORITY

To:

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## PCT

### WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY (PCT Rule 43bis.1)

Date of mailing  
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference  
see form PCT/ISA/220

**FOR FURTHER ACTION**  
See paragraph 2 below

International application No.  
PCT/IB2004/004048

International filing date (day/month/year)  
09.12.2004

Priority date (day/month/year)  
22.12.2003

International Patent Classification (IPC) or both national classification and IPC  
F16D3/205

Applicant  
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1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA"). However, this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of three months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

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WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITYInternational application No.  
PCT/IB2004/004048

J020 Rec'd PCT/PTO 19 SEP 2005

**Box No. I Basis of the opinion.**

1. With regard to the **language**, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.  
☐ This opinion has been established on the basis of a translation from the original language into the following language , which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
  - a. type of material:  
☐ a sequence listing  
☐ table(s) related to the sequence listing
  - b. format of material:  
☐ in written format  
☐ in computer readable form
  - c. time of filing/furnishing:  
☐ contained in the international application as filed.  
☐ filed together with the international application in computer readable form.  
☐ furnished subsequently to this Authority for the purposes of search.
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.  
PCT/IB2004/004048

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**Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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**1. Statement**

Novelty (N)	Yes: Claims	1-5
	No: Claims	
Inventive step (IS)	Yes: Claims	1-5
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-5
	No: Claims	

**2. Citations and explanations**

**see separate sheet**

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING  
AUTHORITY (SEPARATE SHEET)**

International application No.

PCT/IB2004/004048

Re Item V.

**JC20 Rec'd PCT/PTO 19 SEP 2005**

- 1 Reference is made to the following documents:  
D1 : US 5 171 185 A (SCHNEIDER ET AL) 15 December 1992 (1992-12-15)
- 2 Document D1, which is considered to represent the most relevant state of the art, discloses (the references in parentheses applying to this document) a constant velocity universal joint including a hollow outer joint member (20) in which plural guide grooves (26) extending in an axial direction of the outer joint member (20) are formed in an inner peripheral surface, and which is connected to a first shaft (24); an inner joint member (22) which is connected to a second shaft (34), and which is housed in the outer joint member (20); plural leg shafts (40) provided in the inner joint member (20), each of which protrudes in a radial direction of the second shaft (34), and in each of which a convex sphere (42) is formed in a tip portion; and a roller unit including an inner roller (Figs 2 and 3, 66) in which a concave sphere (58) that is engaged with the convex sphere of each of the leg shafts is formed in an inner peripheral surface, and an outer roller (Figs 2 and 3) which is housed in each of the guide grooves (24) of the outer joint member (12) so as to be slidable, the inner roller (26) and the outer roller being movable with respect to each other in an axial direction of the inner roller and the outer roller through a rolling body (62, 66), wherein each of the leg shafts and the inner roller can be oscillated with respect to each other.

From this, the subject-matter of independent claim 1 differs in that (the references in parentheses applying to the application) in the constant velocity universal joint a cylindrical surface (18a) is formed in a radially outer surface of the outer roller (18); a flat engagement surface (24a) which is engaged with the cylindrical surface (18a) of the outer roller (18) is formed in a lateral surface of each of the guide grooves (24) of the outer joint member (12); and the cylindrical surface (18a) of the outer roller (18) satisfies following two equations,

$$We > PCR(1-\cos\theta)/2+\mu_3R3+\mu_2R1$$

$W2 > 3PCR(1-\cos\theta)/2-\mu_3R3+\mu_2R1$  , wherein We indicates a length in an axial direction of the cylindrical surface (18a) from a center ( $O_1$ ) of the cylindrical surface (18a) in the axial direction to an end portion of the cylindrical surface (18a) on an outer peripheral side of the outer joint member (12);

W2 indicates a length in the axial direction of the cylindrical surface (18a) from the center ( $O_2$ ) of the cylindrical surface (18a) in the axial direction to an end portion of the cylindrical surface (18a) on a joint center side of the outer joint member (12);  
PCR indicates a distance from an axis of the inner joint member (14) to a center ( $O_2$ ) of the convex sphere (30a) of each of the leg shafts (30);  
 $\theta$  indicates a required maximum joint angle;  
R1 indicates a radius of the cylindrical surface (18a) of the outer roller (18);  
R3 indicates a radius of the concave sphere (16a) of the inner roller (16);  
 $\mu_2$  indicates a friction coefficient when the inner roller (16) is moved with respect to the outer roller (18) in an axial direction of the inner roller (16); and  
 $\mu_3$  indicates a friction coefficient between the convex sphere (30a) of each of the leg shafts (30) and the concave sphere (16a) of the inner roller (16).

- 2.1 The subject-matter of claim 1 is therefore novel (Article 33(2) PCT)  
The problem to be solved by the present invention may be regarded as how to prevent the load concentration position of the outer roller from moving out of the cylindrical surface of the outer roller (as long as the joint angle is equal to or smaller than the maximum joint angle  $\theta$ ).
- 2.2 The solution to this problem proposed in claim 1 of the present application is considered as involving an inventive step (Article 33(3) PCT) because it is not obvious for the skilled person in the art to design the cylindrical surface according to the mentioned equations.
- 3 Claims 2-5 are dependent on claim 1 and as such also meet the requirements of the PCT with respect to novelty and inventive step.